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March-April 1988

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COVER: Medical Photographer HM1 Tim Town uses a bellows on a 35 mm camera to photograph a mandible close up. Training the Navy medical photographer is the job of the Naval School of Health Sciences. Story on page 19. Photo by HM2 David Van Gelder, NSHS, Bethesda, MD.

The 1988-89 Budget in Perspective

Asset and resource constraint in the Medical Department has been a fact of life for a long time and becomes something we all think about yet again as we examine the 1988-89 budget which is presently being worked through the Congress. The overall Department of Defense reduction was $33 billion, and the Navy's share of that about $12 billion, a major impact on Navy and Marine Corps programs across the board.

The first question is, "What happened to us in the budget?" and a reasonable question it is. At a time when major funding and hardware programs are being slashed throughout the defense establishment, Navy medicine is being funded at a level slightly above that of last year. This is an important signal at a very difficult time in the fiscal history of our services. The civilian and military leadership of the Navy has validated their recognition of our significant fiscal and personnel shortfalls.

At a tough time to do it, when ships are being decommissioned and airwings disestablished, we are one of the few aspects of Navy and Marine Corps endeavor which is achieving modest growth. When considered in the context of what is happening elsewhere, these modest gains are very significant indeed, and must not be underestimated for what they represent in terms of commitment to rebuilding Navy medicine and its capability.

For those of us who have spent most of our careers treating patients in our hospitals and clinics, the results of what happens to budgets in far-away Washington and the budget process within the walls of the Pentagon are sometime mysterious, confusing, and even frustrating. Suffice it to say, the line organization of the Navy and Marine Corps has had to make reductions in other areas in order to ensure that Navy medicine is protected. This is a substantial commitment.

At the same time, we are all called upon to share the burdens of the service, and to make the best use of whatever assets we have by the most intelligent and innovative leadership and management of those things which are allocated to us. The popular recent saying, "Work smarter, not harder," does not apply to us. In this situation, everyone in the Navy and Marine Corps, including us, must do both in order to maintain our capability and continue to provide effective service.

I will continue to represent our needs for people and money before our leadership, and I know I will have your loyal support as I do. In the meantime, funds for such important initiatives as contracting health care workers for our facilities, six new NAVCARE clinics, and fleet hospitals have come on-line. This represents important progress which we should not underestimate, especially in the context of sharply reduced overall budgets. Your hard work has helped make it so. We need to continue to press on, with the knowledge of continued support from our leadership.

VADM James A. Zimble, MC

Working With the Budget Product

The funding level for FY88-89 is encouraging when reductions affecting the Department of Defense and the Navy overall are considered. One of the particularly encouraging aspects is that the budget, even with the $12 billion in decrement to the overall Navy account, enabled us to sustain programs for contracting of personnel which will improve utilization of our facilities.

Fiscal constraints mean that every dollar must be maximally utilized, and every facility must realize the fullest potential from available resources. We have all heard this for years, but now we have the opportunity to do so as far as contracting is concerned. There will be, predictably, continuing pressure to relieve the heavy CHAMPUS burden by bringing more people back into our hospitals and clinics. This has the other desirable and necessary advantage of strengthening our training base with a broader patient load, thus improving both our graduate medical education programs and our contingency/operational capability.

Catchment area management and the CHAMPUS Reform Initiative offer some other possibilities to strengthen and diversify the patient load, and improve our capability to meet our operational commitments to the active forces and our moral commitments to the dependent and retired communities.

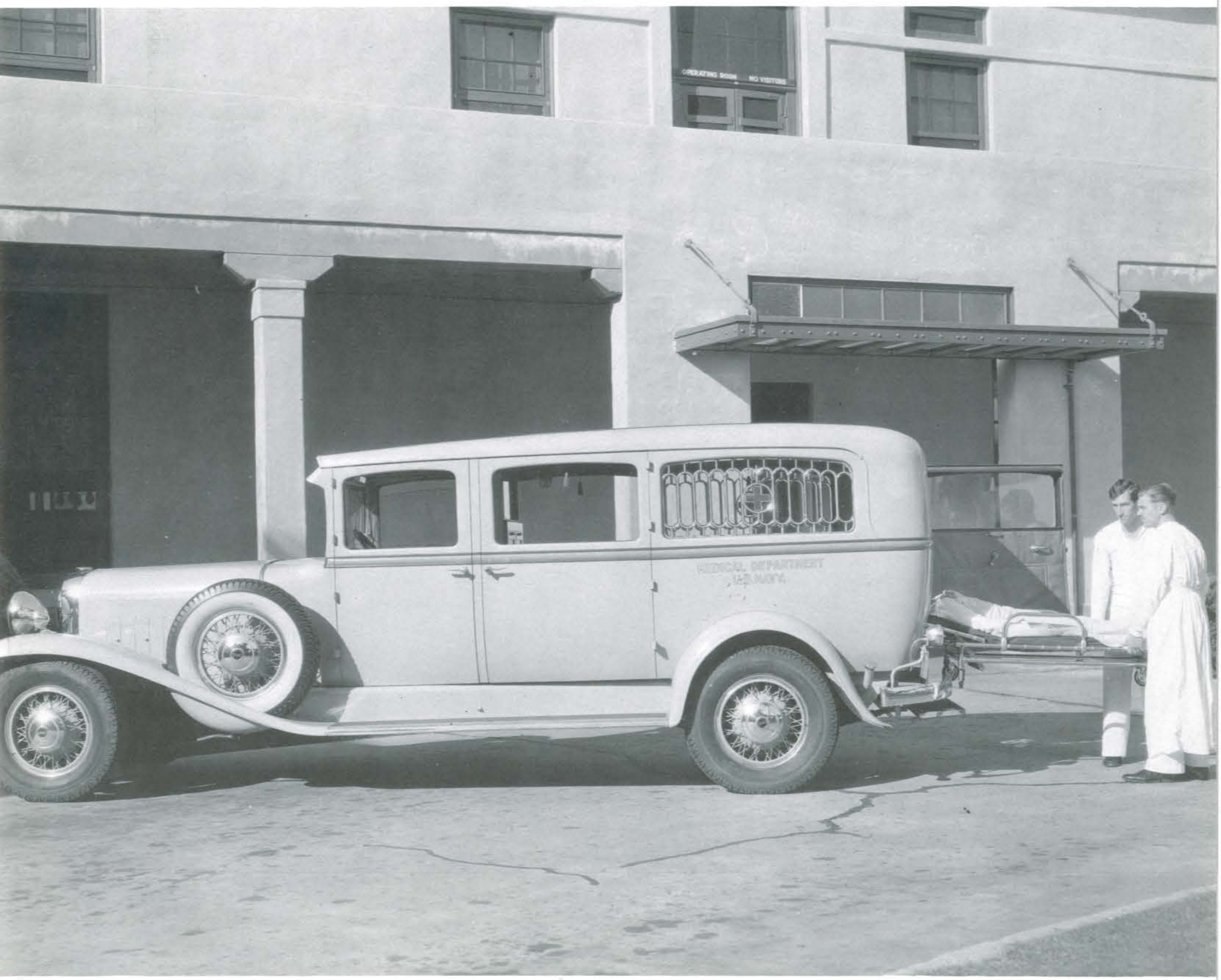
We still have a very large, continuing, important shortfall in critical specialties, ancillary personnel, and the administrative backup for our providers. This has not gone away, but adequate funding will help to relieve the problems to some degree. There are no easy answers in such a severely constrained budget environment, where everyone on the Navy/Marine Corps team must share the shortfalls. That we have endured shortfalls for a number of years is clearly and articulately realized by our leadership in preserving our funding base and protecting our personnel levels at a time when virtually all other segments of defense are experiencing reductions.

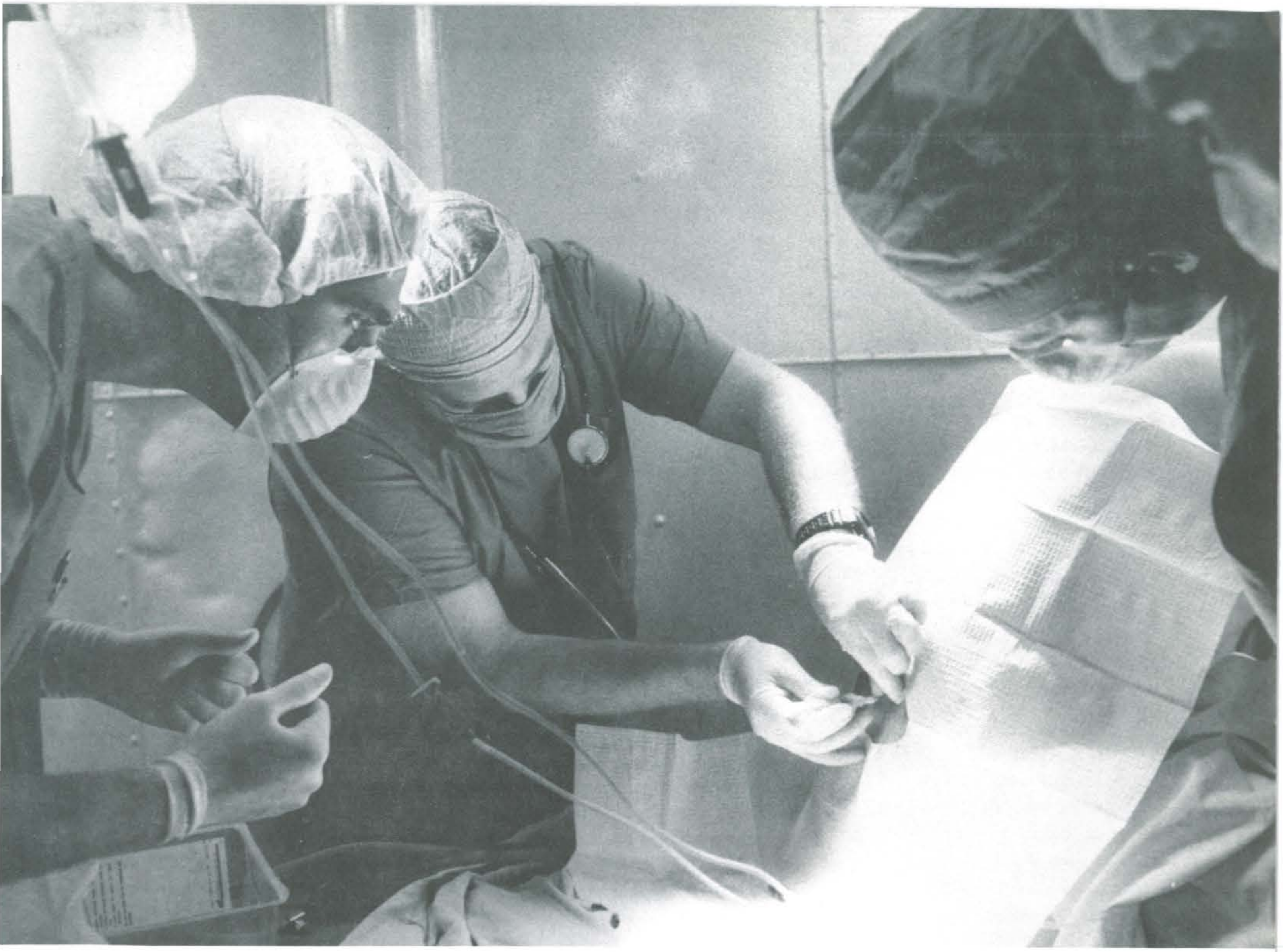
We all recognize that this budget and personnel ceilings do not represent the best of all worlds. At the same time, we should realize that the shortfalls of the past have been recognized and a best effort made to redress them in the current environment. We are committed to obtaining whatever growth is possible and know that there is support at the highest levels in both the uniformed and civilian leadership for continued improvement in our capability. In the meantime, it continues to be up to us to take on the challenges which will make these improvements into realizable and real goals.

The military organizations which traditionally win, even in the face of adverse odds, are the ones with courage, ingenuity, and persistence. We have plenty of the first two in the Navy Medical Department. We will now have the opportunity to exercise the third.

RADM Joseph S. Cassells, MC

A look back: Navy medicine 1934





CDR Stirk administers spinal anesthesia.

Department Rounds

Operation *Iowa*
Battleship Surgery at its Best

Dr. Tallman contemplates the surgery.

Within 24 hours, Battleship *Iowa*'s newest members to its medical staff, the surgical support team, had broken 35 years of tradition. The team made history on 7 Dec 1987 when they operated on BTFN Johnny Jackson. "Surgery of this caliber hasn't been performed on *Iowa* since the Korean Conflict," said LCDR Johnny B. Green, MC, the team's general surgeon.

The surgical support team is made up of Dr. Green, a nurse anesthetist, CDR Lawrence D. Stirk, and an oper-

ating room technician, HM2 Bradley K. Eberhardt. "To make an operating room run, you need more than those three people," Green said. "You need people that are scrubbed in and others that are knowledgeable in the room and know where other equipment is that isn't in your sterile set." One of those men was HM2(SW) David P. McGinnis.

"It was tense at first because I hadn't worked in an operating room for a while," McGinnis said, "but it went OK—it was a test to see how much I could remember."

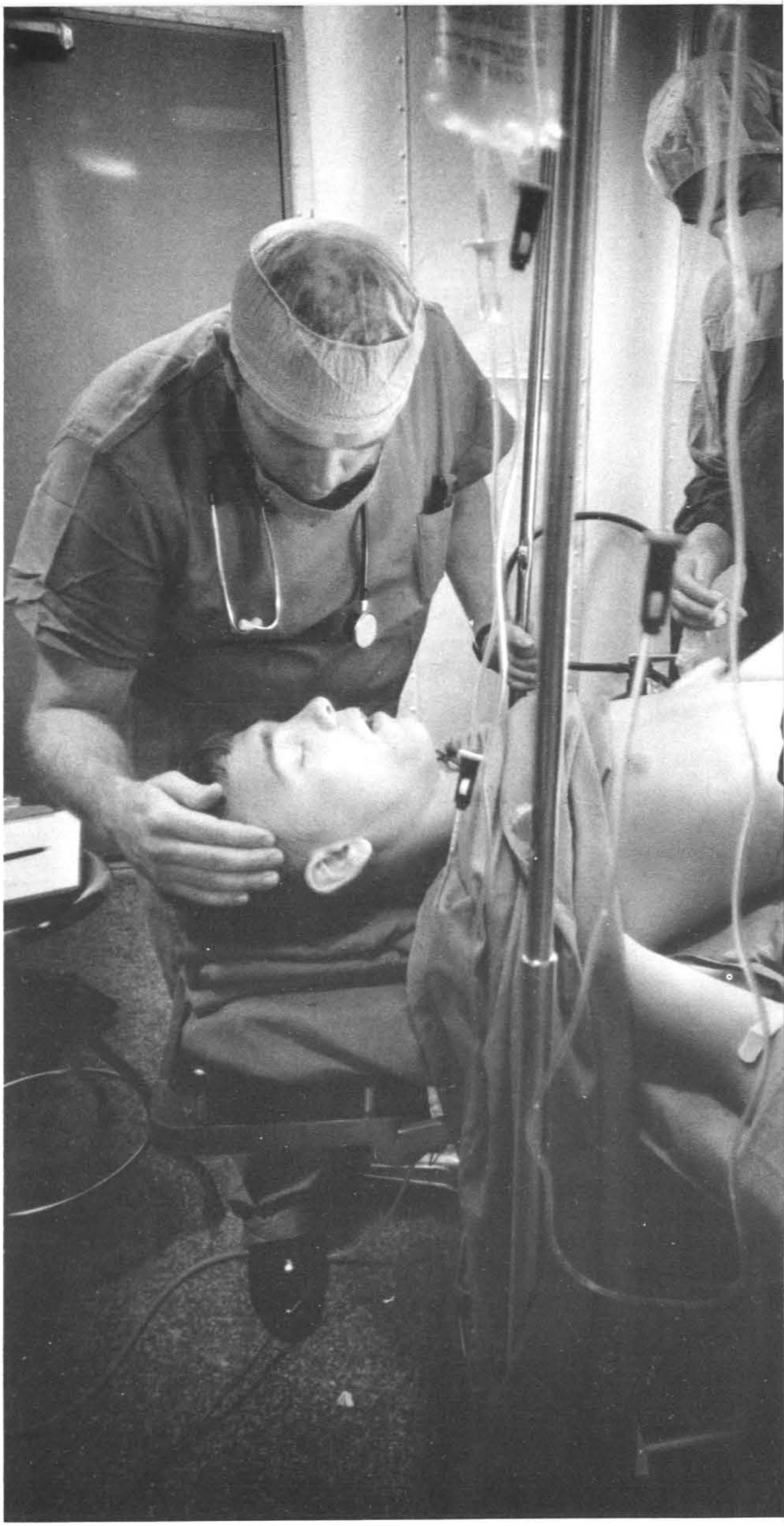
"This team enables us to handle a broader spectrum of patients. We will have to send fewer surgical patients off the ship now," said Dr. David R. Racicot, *Iowa*'s medical department head. "We have the facilities, supplies, and the trained people to do a great deal and operate on many conditions with skill and confidence."

Dr. Racicot said that the team also has a significant amount of sea time and experience in mass casualty drills.

The team may operate on patients other than those on the ship. While in the Indian Ocean, *Iowa* could become the surgical support for other ships if the USS *Okinawa* and USS *Midway*, also operating in the Indian Ocean, are too far north. The *Midway* and the *Okinawa* have full operating surgical teams.

Less than a day following his surgery, Jackson was walking around the medical ward. "I'm alright," he said as he and his IV made their way to the head. "These doctors have been damn good to me." □

—Story and photos by PH2 Robert Sabo, Public Affairs Office, USS *Iowa*.



Stirk keeps a close watch on the patient throughout the operation.

Dr. Green, center, sutures the incision.

The whole OR crew (left to right): *Dr. Green, HN Boxwell, CDR Stirk, HM1 West, Dr. Racicot, HM2 Eberhardt, Dr. Tallman, HM2(SW) Veasey, HM2(SW) McGinnis.* (Front): *HM2 Scintilla and HM2(SW) Balmer.*

Casualty Decontamination During Amphibious Assault

LT Benjamin Gaston, MC, USNR

Recent allegations of chemical and biological weapons use by the governments of Vietnam, Afghanistan, Iraq, and Libya indicate that this internationally outlawed brand of warfare is again an unpleasant fact of life.(*1-3*) The Navy and Marine Corps must be prepared to evacuate casualties contaminated by these weapons during amphibious landings. Helicopters, landing craft (LC), and casualties returning to ships following an assault may require decontamination. This cannot easily be accomplished ashore. Time and space are limited, and everything decontaminated ashore may become recontaminated. Decontamination that takes place aboard ship exposes crews to chemical, and, more importantly, to biological agents and may leave casualties with conventional wounds undiagnosed and untreated for hours.(*4*) Despite these obstacles, a scientifically sound protocol can be devised to minimize risk to combatants and optimize medical care for casualties.

Four possible solutions to the casualty decontamination problem are proposed. First, airtight, efficient decontamination spaces could be designed inside primary casualty receiving and treatment ships (PCRTS). This would require architecturally, administratively, and economically cumbersome alterations on LPH and LHA class ships, though implementation may be possible on LHD's and hospital ships. Total time to wound exposure and treatment would still be delayed. Second, ship's company on PCRTS could stay in mission oriented protective posture (MOPP) gear during the amphibious action. This is a suboptimal solution if for no other reason than that the casualties must be exposed to be treated, would not have the benefit of this gear while on the contaminated ship, and would not have care providers with adequate dexterity to provide treatment.(*5,6*) Third, a limited number of casualties from secondary contamination on the PCRTS could be accepted as inevitable. This policy, however, invites the use of persistent chemical weapons and biological agents such as viruses, and sacrifices medical personnel at a time when they are most needed. Fourth, decontamination could be accomplished en route between the battlefield and the PCRTS. This option offers the most promise.

En route decontamination could be accomplished in several ways. It could take place on the beach by pulling casualties through seawater to waiting landing craft. This technique was used by Iranian soldiers under mustard gas attack near the Majnoun islands.

Those that were immersed in uncontaminated water suffered no gas-induced lesions. Those that were immersed in contaminated water developed worse lesions than those that stayed out.(*7*) In an area where moderate surf continuously decontaminates the water, immersion could be used to remove vessicants. However, absorption of cholinergic agents may actually be enhanced by water immersion.(*8*) Another method utilizes transportation craft.

Proposal

Helicopters generally transport triage class I casualties to PCRTS from the field or battalion aid station. Once airborne, the helicopter environment provides excellent air circulation. A three-member decontamination team in MOPP gear, secured by aircrew safety straps in H-46 or H-53 aircraft, could work as follows.

Two "dirty" crewmen might carry patients into the helicopter without a stretcher, laying them on "clean" stretchers, each covered with two plas-

tic sheets. These two crewmen, once airborne, could cut each patient's MOPP gear in half in a coronal plane, removing the top half. They could then do an "occupied bed" sheet change, removing the bottom half of the clothing and wrapping it in the top plastic sheet. They could wear a fresh set of plastic cover gloves over their own MOPP to touch each patient. All contaminated gear and bedding would be placed in a plastic bag and stowed forward. The patients could then be dusted and dried with a potter's earth glove(*8*) by the third team member, and basic first aid rendered. Finally, the third team member could clean the patients with an alcohol-based antimicrobial(*9*) and remove the bottom sheet, occupied-bed fashion.

In a 20-minute flight, five to six casualties could be processed.(*4*) A new crew in clean MOPP gear would meet the helicopter, carry the patients to clean stretchers for transport to the triage area, and go out on the next flight. A flight deck level decontamination room would be established to decontaminate aircrews and flight deck personnel.

In a second scenario, class II and III casualties would arrive at PCRTS either by helicopter from the field or by LC from the beach evacuation station. Helicopter decontamination of class II and III casualties could be carried out as described above. LC decontamination would be similar, with "clean" casualties moving forward and upwind of the contaminated ones. The outside of the LC should be well cleaned by seawater on the way back to the ship. Clean decontamination crews would move casualties off the LC and onto clean triage stretchers, and then points of contact between the inside of the LC and the ship (i.e., footprints) hosed down. As with conventional warfare, some of the "cleaned" casualties brought to an LPD would later need to be moved by helicopter to a PCRTS.

En route decontamination offers several advantages over the other systems proposed:

- No time is lost decontaminating casualties on the battlefield, and no risk is incurred decontaminating them inside PCRTS.
- There is minimum delay in exposing and treating the casualties.
- Use is made of the flow of clean air and clean water between beach and ship.
- It is applicable to any type of PCRTS, from LPH to hospital ship.
- The system is inexpensive and would be relatively easy to implement.

Before such a proposal moves forward, several questions must be answered about en route decontamination.

- At what rate can casualty decontamination be accomplished inside helicopters and LC? Is this rate adequate to decontaminate all anticipated casualties?
- Can casualties be thoroughly decontaminated in helicopters and LC?
- Which personnel should be designated to be on the en route decontamination teams, and how could their training be kept current?
- How many decontamination trips can a team undertake before becoming exhausted in various climatic settings? How many teams are needed?
- Is seawater decontamination an option? Does cool or cold seawater increase organophosphate absorption in mammals?
- Does the transit back from the beach decontaminate aircraft and LC? If not, how should flight deck and other deck personnel protect themselves?
- Are modifications of these procedures required for certain wounds (e.g., head and neck injuries)?

Answers to these questions could form the basis for a sound casualty movement and decontamination policy covering amphibious actions in chemically or biologically contaminated environments.

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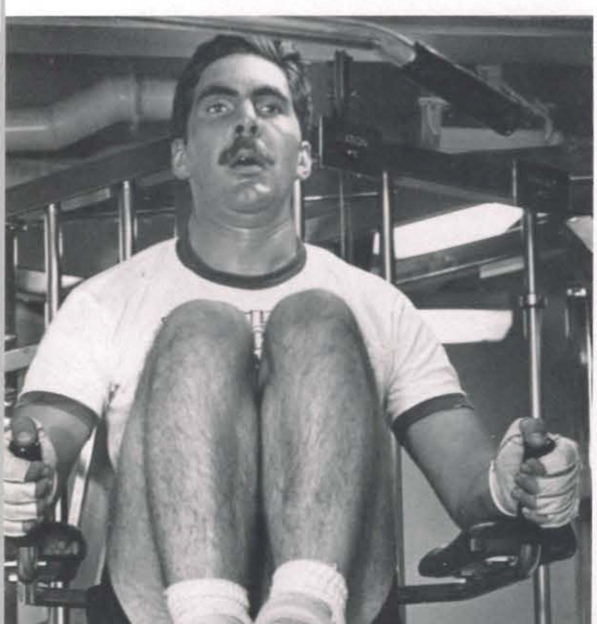
Survey of Physical Training Facilities and Programs On Board Navy Vessels

LT E.J. Marcinik, MSC, USN
J.A. Hodgdon, Ph.D.
J.J. O'Brien, MA



Navy men on board USS New Jersey *(BB-62) work out in ship's gym.*

The Navy has always emphasized the importance of maintaining physical fitness on board ship. Implementation of effective afloat physical training programs, however, has for the most part been unsuccessful. To work efficiently, it appears that fitness programs must be tailored within the space and time restrictions imposed by afloat environments. For improved operational readiness, programs should also be designed to develop fitness abilities necessary to perform Navy jobs.

Work to date has identified a need for upper torso muscular strength for performance of routine shipboard work chores.(*1*) A pilot circuit weight training (CWT) program (running excluded) has been found to enhance muscular strength and muscular endurance while maintaining aerobic fitness of Navy men and women.(*2*) Programs of this sort seem promising for installation on ship platforms where the opportunity for running is limited.

As part of the Naval Surface Force U.S. Pacific Fleet (NAVSURFPAC) recreation program, weight equipment is currently being procured for surface units. The only exercise protocols provided are the manufacturers' brochures that are, in some instances, inadequate in providing protocols and instructions for shipboard utilization. It was requested, therefore, that the Naval Health Research Center provide assistance in the development of exercise protocols for NAVSURFPAC vessels.(*3*) The approach taken was to evaluate physical training facilities and programs currently operational on board a wide variety of ship classes. This information could then be used to design physical training regimes that utilize existing shipboard resources most effectively.

Materials and Methods

Shipboard Survey. Physical training-related data was collected on 20 Navy vessels (14 classifications) homeported in San Diego and Long Beach, CA, by a research team representing the Naval Health Research Center.

Surveyed data included vessel classification, type of operable exercise equipment, utilization rate, and environmental conditions of physical training sites, and the current status of command-sponsored fitness programs for both select populations (i.e., obese personnel) and the entire crew. A list of surveyed ships is presented in Table 1.

TABLE 1
List of Navy Vessels Surveyed

Numbers	*Classification*
(1)	Guided Missile Frigate (FFG), *Oliver Hazard Perry* class
(1)	Guided Missile Frigate (FFG), *Brooke* class
(1)	Frigate (FF), *Knox* class
(1)	Guided Missile Destroyer (DDG), *Charles F. Adams* class
(2)	Destroyers (DD), *Spruance* class
(2)	Guided Missile Cruisers (CG), *Leahy* class
(2)	Guided Missile Cruisers (CG), *Belknap* class
(2)	Tank Landing Ships (LST), *Newport* class
(2)	Amphibious Cargo Ships (LKA), *Charleston* class
(2)	Amphibious Transport Dock Ships (LPD), *Austin* class
(1)	Amphibious Assault Ship (LPH) *Iwo Jima* class
(1)	Amphibious Assault Ship (LHA), *Tarawa* class
(1)	Destroyer Tender (AD), *Samuel Gompers* class
(1)	Destroyer Tender (AD), *Dixie* class

Results

Results of the equipment survey are summarized in Figure 1. Findings show relatively few ships possessed aerobic-type training devices (e.g., 10 percent of vessels maintained stationary bicycles and 5 percent operated treadmills). Weight training devices were found to be more prevalent on board ship. Single station weight machines were present on 55 percent of surveyed vessels while 70 percent had multi-station equipment.

Physical training site information is presented in Figure 2. In general, physical training facilities were found to be utilized to a greater degree underway than in port. Excellent environmental conditions for training were found on the majority of ships. A total of 15 percent of surveyed ships offered no area for exercise.

Figure 3 lists the status of fleet exercise programs. No ship commands sponsored aerobic or strength conditioning programs for the entire crew. However, aerobic programs for select populations (e.g., overweight personnel) were found on 20 percent of the ships.

Discussion

The shipboard survey enabled us to assess the present status of fitness programs and resources in the fleet. In general, findings indicate organized shipboard fitness programs have not been well established. For instance, no

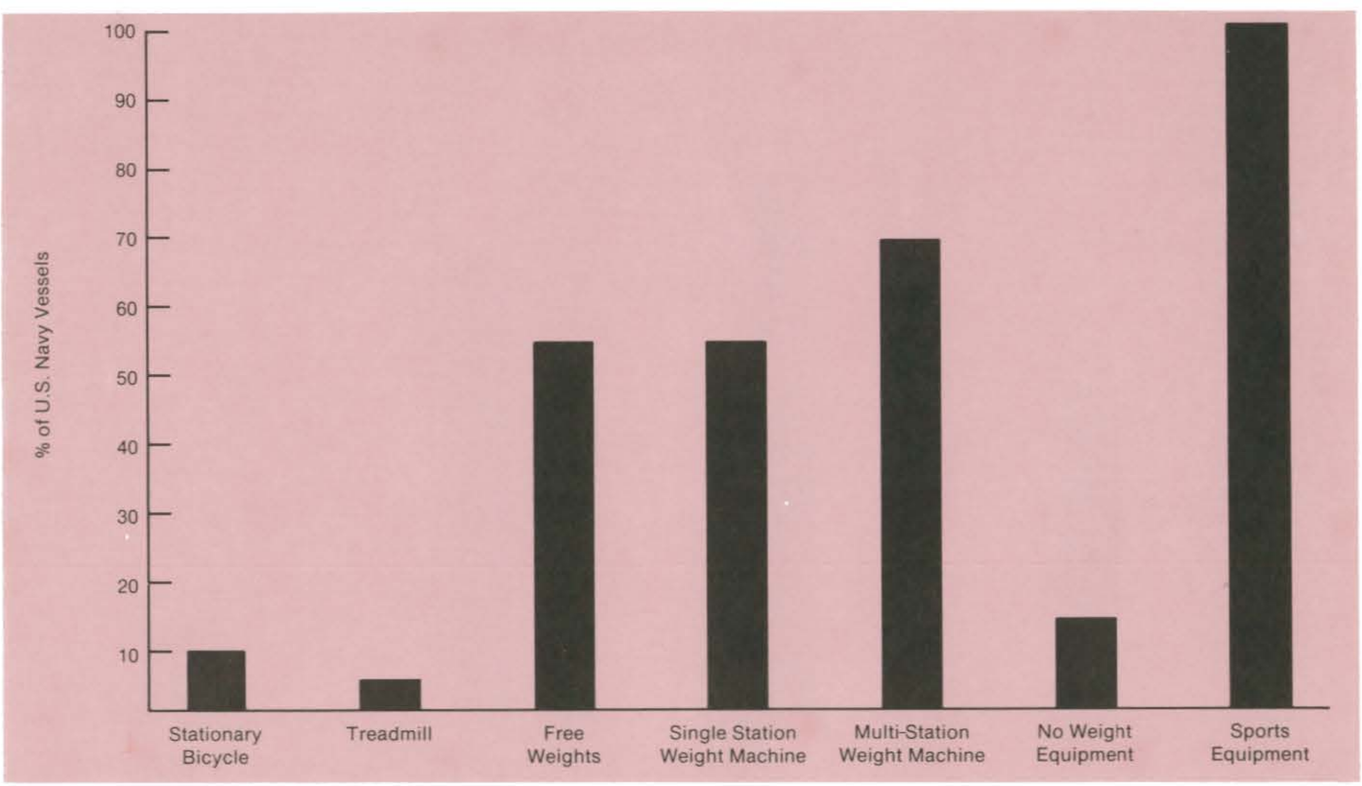


Figure 1. Exercise Equipment Present on Navy Vessels

ship commands sponsored aerobic programs for the entire crew. When present (20 percent of surveyed ships), aerobic programs were undertaken by the following select groups:

- Overweight personnel assigned to mandatory weight control programs.
- Running teams made up of a cadre of running enthusiasts.
- Individuals taking part in personal workouts.

The scarcity of aerobic-based programs in the fleet attests to several inherent shipboard limitations. Limited space availability precludes running on many of the smaller classes of ships. Where conditions for running exist, obstacles such as narrow passageways and shipboard fixtures (i.e., opening doors and hatches) may present real safety hazards. Adverse weather conditions may also prevent or, at least, discourage participation in regular aerobic workouts while underway. Factors such as these lower the effectiveness and reduce the likelihood of establishing programs for cardiovascular health.

Alternative means of developing aerobic fitness, such as provided by specialized exercise devices, were also found in short supply in the fleet. Stationary bicycles and treadmills were present on only 15 percent of surveyed ships. In lieu of jogging, these devices serve as effective training aids in restricted space environments. They appear to be limited in design only to the number of personnel who can utilize them at any given time.

Likewise, organized strength conditioning programs were found to be nonexistent in the fleet. Although 85 percent of vessels operated weight training rooms, these spaces were used almost exclusively by a select group of individuals for body building or power lifting workouts. Essentially, exercise spaces could be divided into two main categories:

- Built-in exercise rooms such as those found on board *Spruance* class DD's.
- Redesignated spaces converted into functional exercise rooms (e.g., converted storage areas found on board *Tarawa* class LHA and *Dixon* class AD).

In general, exercise spaces were found to be underutilized. The majority of exercise spaces had restricted hours of operation which limited the number of personnel using them on a regular basis.

It should be noted, the majority of ships were well furnished with a variety of free weights and single or multistation weight equipment. Because of the lack of adequate supervision, however, exercise equipment was often improperly used. While injury data was not within the scope of this survey, such circumstances seem to increase the chance of both personnel injury and equipment damage.

Examination of Figure 2 shows utilization of physical training sites to be higher underway than in port. Access to more elaborate shore-based recreational facilities may have largely con-

Figure 2. Physical Training Site Utilization and Environmental Conditions

tributed to this finding. Only 3 of the 20 ships surveyed had no designated exercise space. These ships were the *Adams* class DDG, and both *Leahy* class CG's. Limited space availability seems to almost exclude the implementation of equipment dependent fitness programs on these ships.

Finally, it should be mentioned that 70 percent of ships provided excellent environmental conditions for physical conditioning. Only ships utilizing redesignated exercise spaces (i.e., the *Austin* class LPD and *Tarawa* class LHA), did not provide adequate ventilation and were poorly lighted.

Conclusion

It can be concluded from this investigation that favorable conditions currently exist in terms of availability of training facilities and exercise equipment for maintenance of fitness afloat. The absence of command-sponsored fitness programs, however, has placed the responsibility of maintaining fitness on the individual crewmember. It appears this situation has led to an inefficient utilization of present recreational resources. Findings reveal a need to design effective conditioning formats which fully utilize existing resources and address the personal fitness needs of the entire crew.

Based on findings of this survey and prior physical training-related studies,(*2,4,5*) it is recommended that a circuit weight training approach to conditioning be utilized for shipboard personnel.(*6*) Circuit weight training involves brief episodes of weight lifting compatible with tight ship work schedules. Circuit weight training also utilizes multi-station equipment functional in close quarters and presently in use on a wide variety of Navy vessels.

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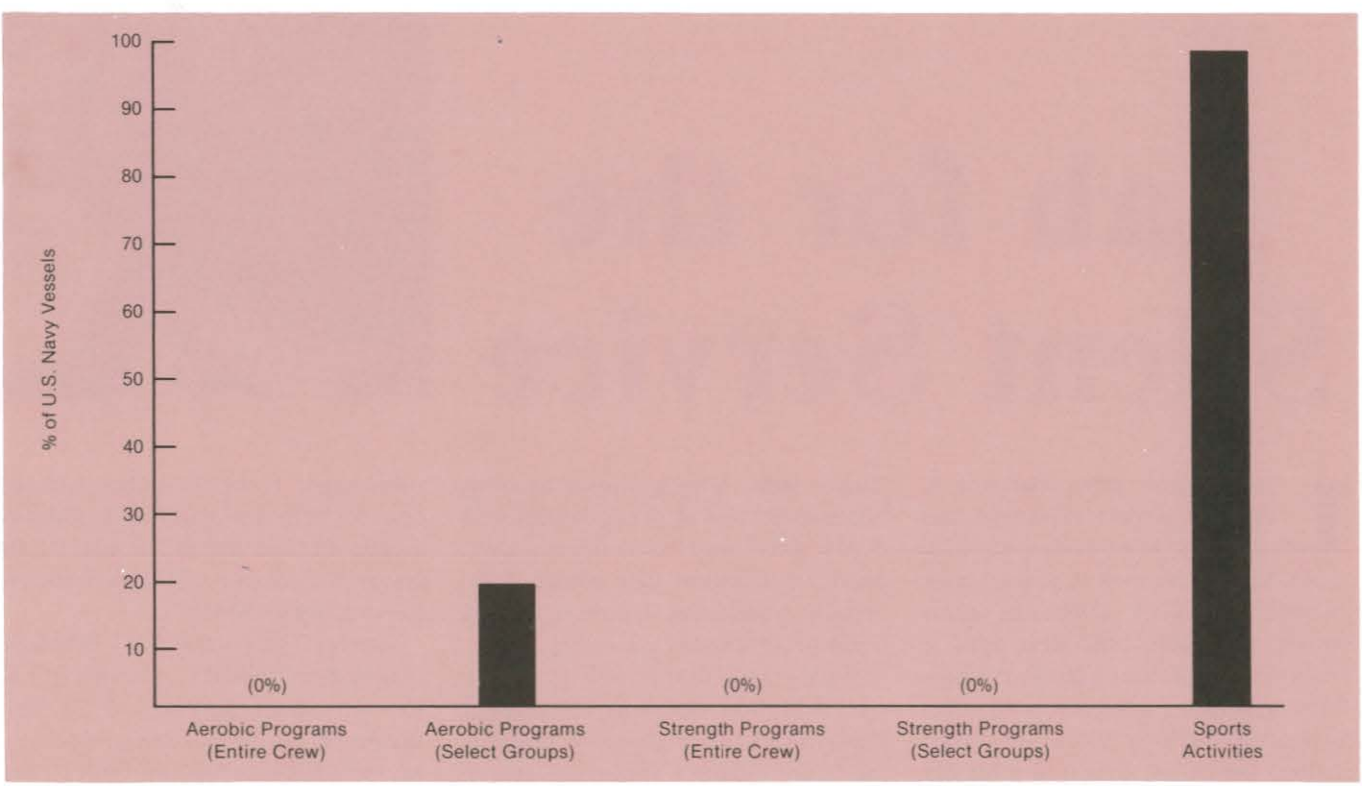
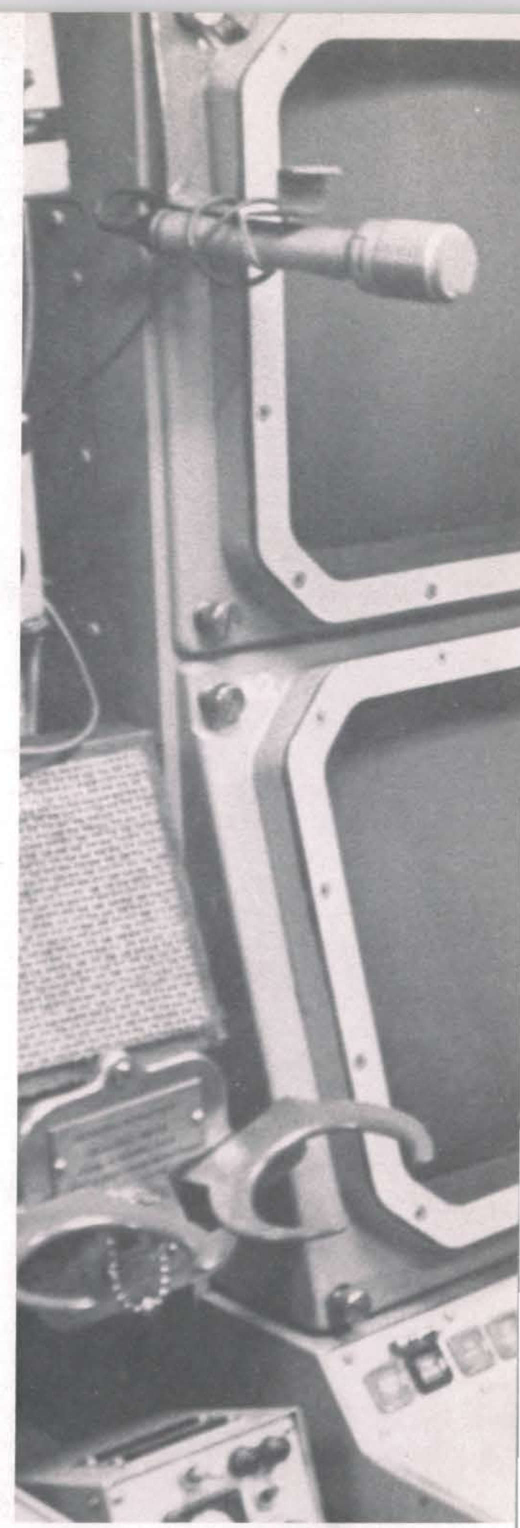


Figure 3. Status of Command-Sponsored Fitness Programs



A sonar operator sits at a BQQ-5 console. This device can present many different and often complex displays.

An Update

Lab for the Silent Service

Last summer news that one of Japan's largest exporters had provided advanced technology to the Soviet Union sent shock waves through the Navy submarine community. Between 1981 and 1984 a Toshiba Corporation subsidiary and a Norwegian arms company sold computerized milling machinery that enabled the Soviet Union to fabricate ultraquiet propellers for the first time. Soviet subs, always known as noisy boats detectable at over 50 miles, suddenly gave way to a dramatically quieter generation that could, under certain conditions, sneak within 12 miles of an unwary adversary.

What this all means for U.S. submarine detection capability is evident. Responding to the threat by developing more sensitive acoustical gear is only part of the solution. Enabling the submariner to better utilize technology to help interpret and identify targets further out is the role of the Naval Submarine Medical Research Laboratory (NSMRL).

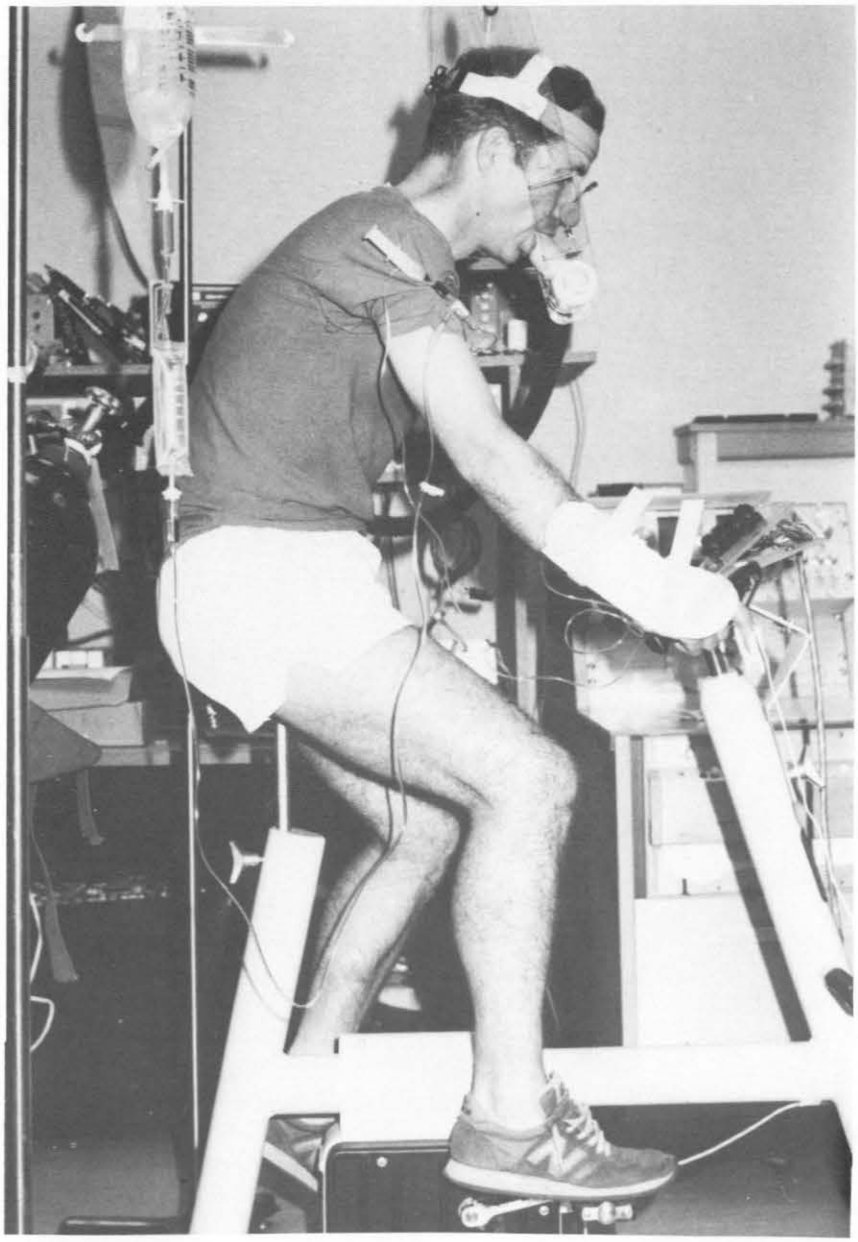
Almost 7 years ago *Navy Medicine* reported on NSMRL's activities ("Lab for the Silent Service," *U.S. Navy Medicine,* November 1981). Recently, we went back to Groton both to find out what scientists are doing to help

respond to the Soviet threat and to learn about the work being done to improve the submarine atmospheric environment.

Visual Sonar Displays

NSMRL has conducted a large number of studies aimed at improving the comprehensibility of the often complex visual sonar displays. One of the approaches being investigated, explained Dr. S.M. Luria, director of the behavioral sciences department, is to color code the displays. Researchers have found that an unexpectedly large number of colors can be used without much confusion if the correct colors are chosed and used properly. This almost doubles the speed of interpreting complex geographical situation displays.

Another line of research is attempting to find out what characteristics of the display a sonar operator pays most attention to. In a "waterfall display," the faint sounds produced by a target activate some percentage of the pixels along a given bearing. No one has determined if the operator discerns that row because of the way the lighted pixels are distributed along the line, because pixels of the same brightness are grouped, or for some other reason.



A subject works hard on a bicycle ergometer under reduced oxygen while his breath and blood are being analyzed.

If the important factors are determined, the displays can then be designed to emphasize those factors, thus improving the operator's performance.

Auditory Research

Much of NSMRL's sonar research is classified. Nevertheless, Dr. Jerry V. Tobias, who directs auditory research, broadly outlined the most important problem he and his colleagues must solve—how to help the sonar operator identify targets at greater distances. It is a complex problem with many variables. With quieter and quieter submarines, background noise (ocean sounds) and a signal emanating from a propeller sound very much alike. The aim is to hear what is operating in the ocean as a separate entity from the ocean itself.

One way of improving the effective signal to noise ratio is to make the signal sound clearer. This can be accomplished both by improving the sensing technology *and* by determining the limits of human auditory response. Understanding how the brain analyzes the signal is the key. "Once that goal can be achieved," Dr. Tobias says, "we might be able to teach a computer to do it. But that is many years down the road. We're not yet ready to replace the person because we don't quite understand how he does what he does."

Noise Standards

NSMRL is also doing basic research that eventually will aid in the development of standards for hyperbaric noise exposure. Current OSHA (Occupational Safety and Health Administration) and Navy noise standards were designed for people working in normal sea level atmospheric conditions. Underwater, hyperbaric conditions are very different. A diver may be wearing a hard helmet and breathing a mixed gas atmosphere. That atmosphere combined with the water medium alters sound transmission. A person working out of water may be able to use a noise-producing tool for 15 minutes safely. Underwater he may be able to use the same tool for several hours with no adverse effects. A new safety standard, therefore, would enable longer working periods.

On the other side of the coin, the Lab is examining the possible negative effects of underwater noise on the ear. There are structures in the external and middle ear that in air at normal pressure attenuate (lower the volume of) very high and very low frequency sounds. With the head submerged in water those portions of the ear no longer offer adequate protection for the inner ear, which may be extremely vulnerable to noise. How much and what kind of noise is harmful to the protected or bareheaded diver? Does a helmet or wet suit hood offer significant protection? NSMRL scientists, headed by Paul Smith, are seeking the answers in a long-duration study.

Computer Assisted Diagnosis

It is difficult to provide high quality medical care on submarines. The limited facilities and absence of laboratory equipment would present a challenge to the most experienced physicians. Yet, except for the new Trident submarines, there have been no physicians aboard U.S. submarines since 1972. The submarine hospital corpsman is the sole medical practitioner on board. When a serious illness occurs, he must decide whether to treat the patient or recommend evacuation. Evacuation is costly, dangerous to both the patient and the rescue party, and may compromise the sub's mission. The computer, with its ability to organize and present large data bases, can substantially augment the corpsman's capabilities.

Dr. Bernard Ryack, CDR David Southerland, and their team have prepared and adapted several computer diagnosis programs for use on submarines. The first ones deal with the diagnosis of abdominal pain—the most common complaint aboard submarines—and chest pain. In addition, computer programs concerned with dental problems, psychiatric problems, and trauma are being developed. These programs will eventually prove useful not only on submarines but in isolated environments as well.

In the auditory and communications sciences department's new psychoacoustics laboratory, STS1(SS) Mark Nash, NSMRL sonar consultant, works on an experiment that compares visual with auditory displays of sonar signals.

Submarine Environment

Evaluation of the submarine atmospheric environment is another of NSMRL's priorities. Submarines of World War II and before were powered by diesels on the surface and batteries while operating submerged. When on batteries, subs had to surface periodically to recharge. Nuclear plants now enable submarines to operate submerged for months at a time while providing enough power to create and maintain a breathable atmosphere for the crew. Electrolysis of water helps replenish that atmosphere's oxygen content; scrubbers remove excess carbon dioxide.

In the years following the launch of the *Nautilus*, nuclear submarine scientists thought they had solved many of the complex problems related to atmosphere control and monitoring. In many ways they had, but as technology advanced, so did the ability to refine and improve. Nuclear subs have, as part of their machinery, the CAMS (Central Atmosphere Monitoring System). These units provide data on levels of oxygen, carbon dioxide, carbon monoxide, hydrogen, and nitrogen. Newer models have microprocessors that monitor other hydrocarbons. But even the newer CAMS can only give readouts on gross totals of these gases.

According to CAPT Douglas Knight, MC, of the biomedical sciences department, the analytical technology able to detect trace compounds in the submarine atmosphere is a relatively recent development. As a result, volatile hydrocarbons—the products of hydraulic fluids, lubricating oils, cooking, smoking, etc.—can be detected and measured down to parts per million concentrations.

Present research involves sampling both submarine atmospheres and the expired breath of crewmembers. Researchers then subject the samples to mass spectroscopy or gas chromatographic mass spectroscopic analysis to determine the presence of compounds and their levels. Preliminary tests have suggested that during the course of a patrol, there may be a trace buildup of hydrocarbons in the human system. However, following the cruise, the body quickly purges the contaminants.

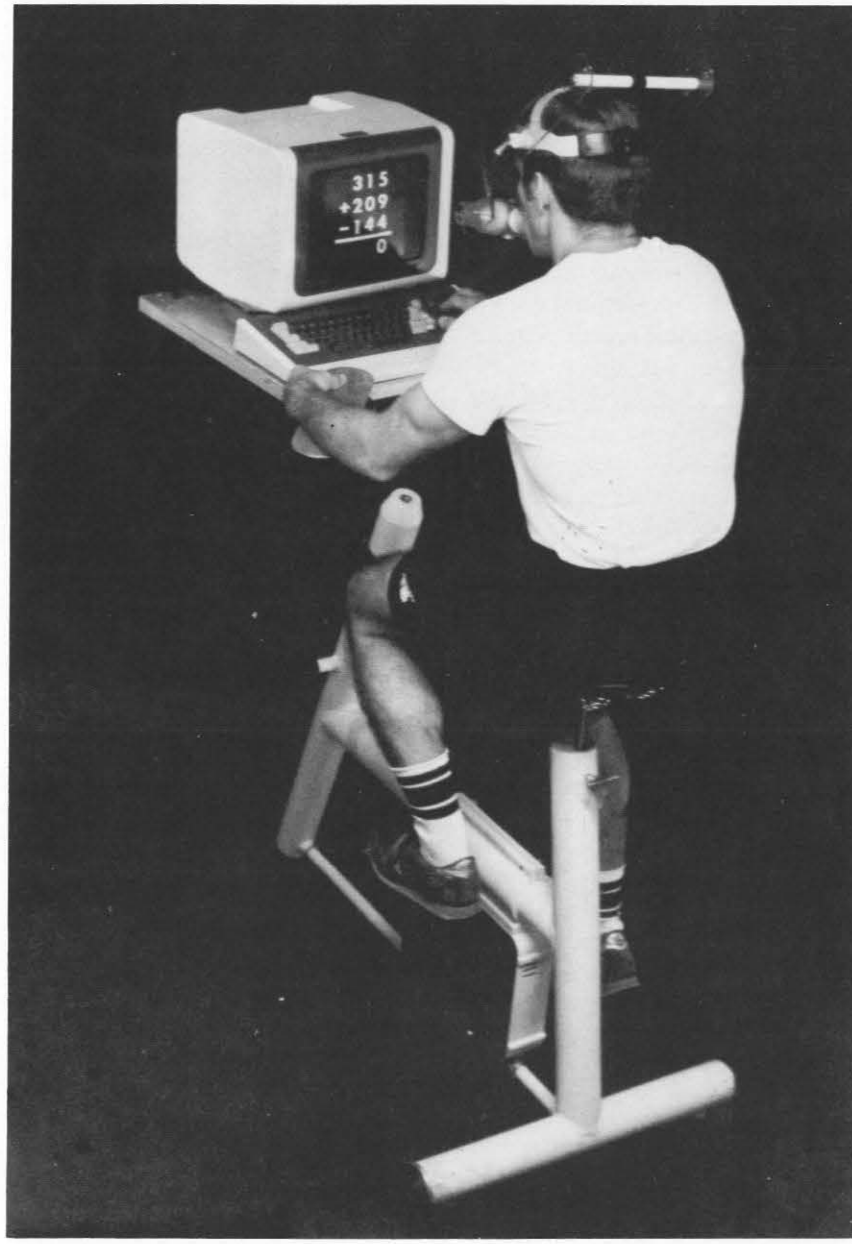
Submarine ventilation systems are very efficient and the air submariners breathe is safe. But can it be even safer? One practical outgrowth of this research may well be the development of a filter material much more absorbent than the activated charcoal now in use.

Oxygen Concentration

Another of NSMRL's studies is oxygen concentration. The goal is to define the partial pressure of oxygen that will support life and yet permit low enough concentrations to suppress fires in the submarine environment.

Navy submarines currently operate with a 21 percent oxygen concentration. Preliminary studies indicate that reducing this concentration only 2 percent may have dramatic effects on combustibility. Fire aboard a surface vessel can be catastrophic enough. Aboard a submerged submarine it can quickly snuff out life. "There's nothing more terrifying than getting a fire alarm while submerged," pointed out Dr. Knight. "You simply can't open the hatches to let in fresh air."

Dropping oxygen concentration from 21 percent to 19 percent yields a



An NSMRL experiment in progress measured the combined effects on cognitive ability of low 0_2 (12 percent) and vigorous exercise. HM1 Dan Francis shows how subjects key in solutions to mental arithmetic problems while cycling and breathing on low 0_2. The subject's responses are immediately stored in the computer for data analyses.

35 percent reduction in combustibility. In one very dramatic experiment, Dr. Knight ignited a row of candles in a 21 percent atmosphere. The candles burned with bright, vigorous flames. At a 19 percent concentration, the candles burned slower. At 17 percent their flames were very small. At 13 percent he found it impossible to ignite paper or candles.

Yet the oxygen reduction seems not at all harmful to the human system. Over the course of a 2-month study at the Army's Institute for Environmental Medicine in Natick, MA, oxygen levels were dropped to 19, 17, and even lower percentages. Subjects rode bicycle ergometers and took a battery of psychological and physiological tests. The researchers found no noticeable degradation in performance at 17 percent oxygen. In fact, at a 17 percent oxygen concentration the submarine atmosphere would not be very different from what the residents of Denver might breathe on a rare, smogless day.

The laboratory phase of this research is complete, and pierside sampling would be the next phase. What remains is sampling and judging human performance during actual cruise situations. Whether the Naval Sea Systems Comand's manual on the submarine atmosphere can be updated will in large measure depend on the final results.

Diving Research and Submarine Rescue

NSMRL has been carrying out a research program in diving submarine medicine since World War II. James Parker, chief of the hyperbaric research division, pointed out that the concept of saturation diving began there under the leadership of CAPT George Bond, and NSMRL did all the research leading up to the Man-in-the-Sea program. Submarine escape and rescue also have long been a focus of research.

Currently, the laboratory is seeking solutions to the problems associated with the rescue of crewmen from a disabled submarine, in which the pressure has increased due to flooding. This places the men in the same condition as that found in saturation diving and makes them susceptible to the toxicity associated with breathing air under pressure. During rescue, these men must be decompressed to atmospheric pressure slowly so as to avoid decompression sickness (the bends). Because of circumstances not found in routine diving operations, NSMRL is devising special techniques for rescue, including unique decompression tables and special gas mixtures. The lab is also developing a manual for fleet use in any type of submarine rescue operations. —JKH

Creating the Navy Medical Photographer

A photographer is a photographer—unless he's a Navy medical photographer. There is a difference. Any good photographer or photojournalist should be fluent with a variety of cameras, camera formats, films, lighting, processing chemistry, and proper printing techniques. The medical photographer must also have the skills and temperament to shoot a crime or accident scene, a child abuse case, an autopsy, or a tissue specimen through a compound microscope. He or she must be equally at home in a sterile operating room photographing a surgical procedure millimeters from the lens. Processing the film and then producing textbook quality prints or slides for publication or presentation is a matter of routine.

Training this versatile professional is the job of the Naval School of Health Sciences (NSHS) in Bethesda, MD. The Medical Photography School, one of NSHS's eight technical schools, is unique in the Navy. Operating in newly renovated space in the Bethesda Hospital Tower, the school has a well-equipped darkroom, classrooms, access to a mock operating room, and some of the most experienced Navy medical photographers for instructors.

Even though the curriculum is very demanding, competition for enrollment in the school is keen. The average class size is seven or eight students and, surprisingly, many have had little previous experience with a camera. "It's better that way," insists HM1 Earl McDonald, an instructor. "We don't have to untrain them before we teach them to do it the right way."

HM2 Bill Williams shoots an intraoperative procedure using the latest in photo-medical technology—a 120 mm Nikor medical lens.

Photos by HM2 David Van Gelder

Classroom Phase

Doing it the right way means learning photography from scratch. In a course entitled **Still Photography**, students are exposed to the theory of light—how it behaves and how it affects light-sensitive film. How light is directed onto film is covered in the theory of optics. Here the students learn how lenses refract light and what characteristics affect focal length.

Before this basic course is completed they will also begin the fundamentals of composition and portraiture and have ample opportunity to practice their new craft with several camera formats, including the classic 4 x 5 Speed Graphic, 4 x 5 view camera, 2¼ x 2¼, and the 35 mm single lens reflex. Most equipment they are trained on, they will eventually use out on the job.

Black and White Processing introduces students to the darkroom, with emphasis on darkroom chemistry, and developing and printing black and white photographs. Here they pick up basic techniques of determining exposure and proper choice of photographic materials.

The next course is **Color Processing** which includes a comprehensive look at the theory of color photography. The students learn the nuances of making color prints and how to process and duplicate color transparencies.

HMC Eric Larson demonstrates the functions of a view camera to the medical photography class.

Medical Photography introduces an element into the curriculum that makes the profession unique—the photographing of medical subjects, i.e., patient case documentation in the studio, clinic, and the operating room. Practice application of photomacrography and specimen photography are taught as well as infrared and ultraviolet techniques. For this course students practice in the mock operating room where everything but the patient

Something to Shoot For

As with many professions, medical photographers have an organization they can affiliate with—the Biological Photographic Association. Under its auspices, a medical photographer can qualify as a Registered Biological Photographer (RBP). The aim of the RBP program is to establish standards by which a capable medical photographer can be recognized by his or her peers.

Several major colleges and universities offer comprehensive programs in biomedical photography and, in some cases, RBP candidates can receive credit after successfully completing RBP certification.

The program leading to certification consists of three parts. A written examination tests the candidate's basic and specialized knowledge in:

- Photographic Optics
- Biological Terminology
- Planning and Producing
- Materials and Processes
- Photographic Chemistry
- Applied Light and Filters
- Applied Camera and Lighting Techniques
- Audiovisual Information
- Color
- Videography
- Cinematography
- Photomicrography
- Photomacrography

A practical examination requires the applicant to produce and submit a number of prints and transparencies that demonstrate the applicant's ability to produce photos that are professional in concept and execution. The portfolio consists of 18 required and no more than 12 elective assignments.

For the oral examination, the applicant meets with oral examiners, all RBP's.

Following completion of these three requirements the applicant is deemed fully qualified and his or her name is then entered in the Register. The candidate is also awarded a certificate attesting that he or she is a RBP and a prestigious member of a very unique and specialized community.

For further information on the RBP program contact: HM1 Peter Grattan, Naval School of Health Sciences, San Diego, CA 92134. Autovon: 987-2550, Commercial: (619) 233-2550.

Students learn to use special lighting for closeup photography.

is real. If he or she touches a sterile field, the reaction from the OR personnel is the same as it would be in the real OR.

Public Affairs Photography teaches how to shoot ceremonies, group and personnel photography for applications and records, and subjects for historical documentation.

Forensic Photography covers crime and accident scenes, including aircraft accidents, with emphasis on medical-legal documentation such as evidence and chain of custody. Students also learn techniques of documenting abuse and rape cases in support of the Navy's Family Advocacy Program and Naval Investigative Service.

Audiovisual Techniques covers high quality copy photography and reproduction of EKG's, radiographs, and line and continuous tone originals.Not all a medical photographer's work takes place behind a camera.

Administration and Supply presents photo lab administration and introduces workload documentation, equipment procurement, and budget preparation. Proper maintenance of negative files and stock control are also emphasized. These latter skills are as vital as the photography itself because many of the graduates will go on to fill independent duty billets and run their own labs.

Clinical Phase

Following these 14 weeks of didactics, students enter the clinical phase of training and move up a floor to begin working in the hospital's medical photography department where they get to practice what they have learned in the classroom. Under supervision, they rotate through the five sections. Doing "medicals" means shooting autopsies and anatomical pathology subjects as well as surgery in the real operating room. Students also photograph preoperative and postoperative patients for residency certification programs and do photography for diagnostic purposes.

Shooting living subjects gives students the opportunity to practice a skill they will find useful in their careers—sensitivity to their human subjects. "Being a medical photographer requires a great deal of tact," points out HM1 McDonald. "One must take a photograph of a patient, a very graphic representation of whatever physical anomally that person has, or document the visual effects of a brutal act. The interaction between photographer and patient is critical. It takes practice. There's a lot more to it than photography."

There are other sections as well: **Color, Copy, and Supply**. In **Black and White**, students shoot individual and group portraits, and process film and print photos.

Projects

Some of the toughest and most creative assignments students face throughout the 30-week school are the 15-20 individual projects covering every major photographic subject and situation. An initial project might call for a single subject in daylight. The student would select a camera-lens combination, appropriate film, and then shoot the subject, process the film, and print one or a series of photos that would demonstrate mastery of composition, exposure, processing, and printing technique. Succeeding projects obviously become more difficult.

If the subject covered in the classroom were medical-legal, the student might lay out and photograph a crime scene and then present a report and photos to be graded and then critiqued in class. Students can then benefit from the mistakes and insights of their colleagues and reinforce what they have learned.

If the mission of the medical photographer is to document disease, injury, surgical technique, and other medical subjects, the graduate of the Medical Photography Technician School is more than ready to perform and, if necessary, run his or her own lab. "We try to teach them the correct way and give them some idea of what it's like working in this NEC," says instructor Earl McDonald. "They get a good background here. Working in any Navy medical photography lab won't require major adjustments." —JKH

Guam Medical Photographer

HM2 Jeffrey Roth is the Navy's only medical photographer on Guam and a graduate of the 7-month Medical Photography School at the Naval School of Health Sciences, Bethesda, MD. "We learn color, black and white photography and portraits, in addition to public relations," said Roth. "We do everything from shooting to developing to printing."

HM2 Roth has been in the Navy for 8 years but has spent only the last 11 months as a medical photographer assigned to the Naval Hospital in Guam.

When he joined the Navy he intended to become a corpsman, but not necessarily a medical photographer. He explains that, like many people, he came into the Navy for economic reasons. "The Navy looked like it had opportunities for me and I was interested in the medical field," he explained.

He got involved in the medical photography field because he wanted a skill that he could use outside the Navy, something he could make a living at. "I was interested in photography, and this way I could learn a skill and get paid for it."

Roth's assignment means he does a lot of things besides take pictures. Since the billet here is an independent one, he has the burden of doing everything relating to photography to support the hospital and the commanding officer. In addition to photographing autopsies, surgical procedures, and taking photographs for legal cases such as spouse abuse or child abuse victims, Roth also maintains a photo lab, tends to the budget and supplies, and shoots portraits, awards ceremonies, and special events at the hospital. And then he processes the film and prints the pictures. He is also on-call 24 hours a day.

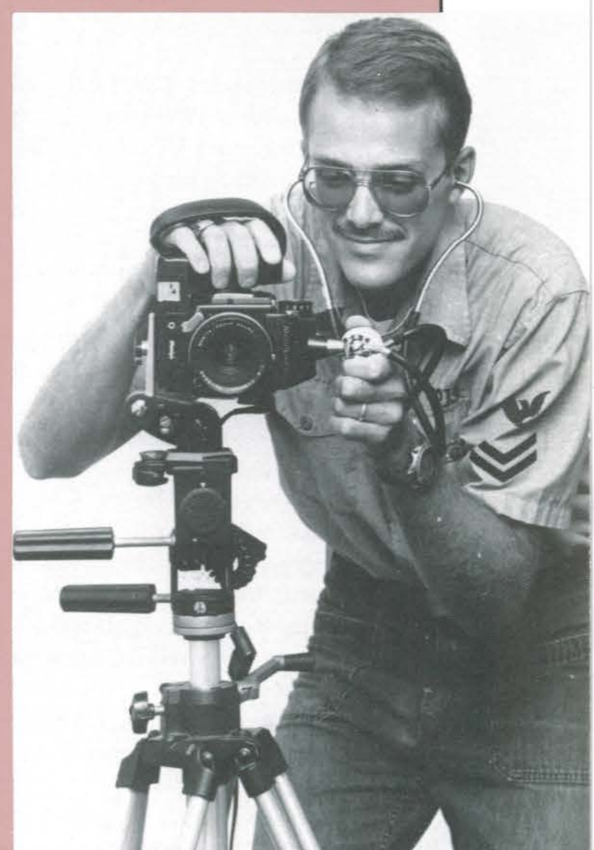
HM2 Roth says that photography is also a hobby of his. He is pursuing a B.A. degree through the New York Regents program during his off-duty time. "I have enough credits, just not in the right areas," he said.

Much of Roth's work is used for training, such as the photographs taken of surgery procedures or autopsies. In addition, he is called upon for what he refers to as medical-legals—photographs of abuse victims that may be used in court.

Because his job here is independent duty, Roth feels that he is a more versatile worker as he is responsible for all areas of his assignment and not just one specific area. "Here I do everything," he said. "I get to know everyone really well and there is a lot of variety. But it (independent duty) is harder in a way because you have no place to hide if something goes wrong. I feel it makes you a lot better at what you do. My job continues to be very rewarding. Just when I think it's getting a shade tedious, 10 people call and want something."

—JO2 K. Dean, Commander Naval Forces Marianas/Commander Naval Base Guam.

Medical Photographer Jeff Roth examines the chief tool of his profession.



PH1 R. Mitchell

Fever/Diarrhea Research Aboard UNITAS XXVI

CAPT Michael E. Kilpatrick, MC, USN
CAPT Raymond L. Sphar, MC, USN
CAPT Alan E. Mataldi, MSC, USN

The concept for UNITAS was developed in 1959 when South American and U.S. Navy officers met and planned mutually beneficial operational exercises for all participating navies. The first UNITAS operation was in 1960 and achieved that objective. UNITAS has since become an annual event for the Navy and the navies of many South American countries. In 1985, UNITAS XXVI marked the first time a 6-month, on board research protocol evaluated Navy and Marine Corps participants who acquired fever and/or diarrhea during the exercise. This study was feasible because of the Naval Medical Research and Development Command's (NMRDC) newest overseas facility in Peru.

Naval Medical Research Institute Detachment (NAMRID), Lima, Peru, became a reality in January 1983 after the Peruvian Navy had suggested in 1978 that the U.S. Navy establish a tropical medicine research facility in Peru. NAMRID's mission is to assess the distribution and determine the risk of militarily relevant infectious diseases in South America. The research facility is hosted in Peru by the Peruvian Navy under a country-to-country/navy-to-navy agreement.

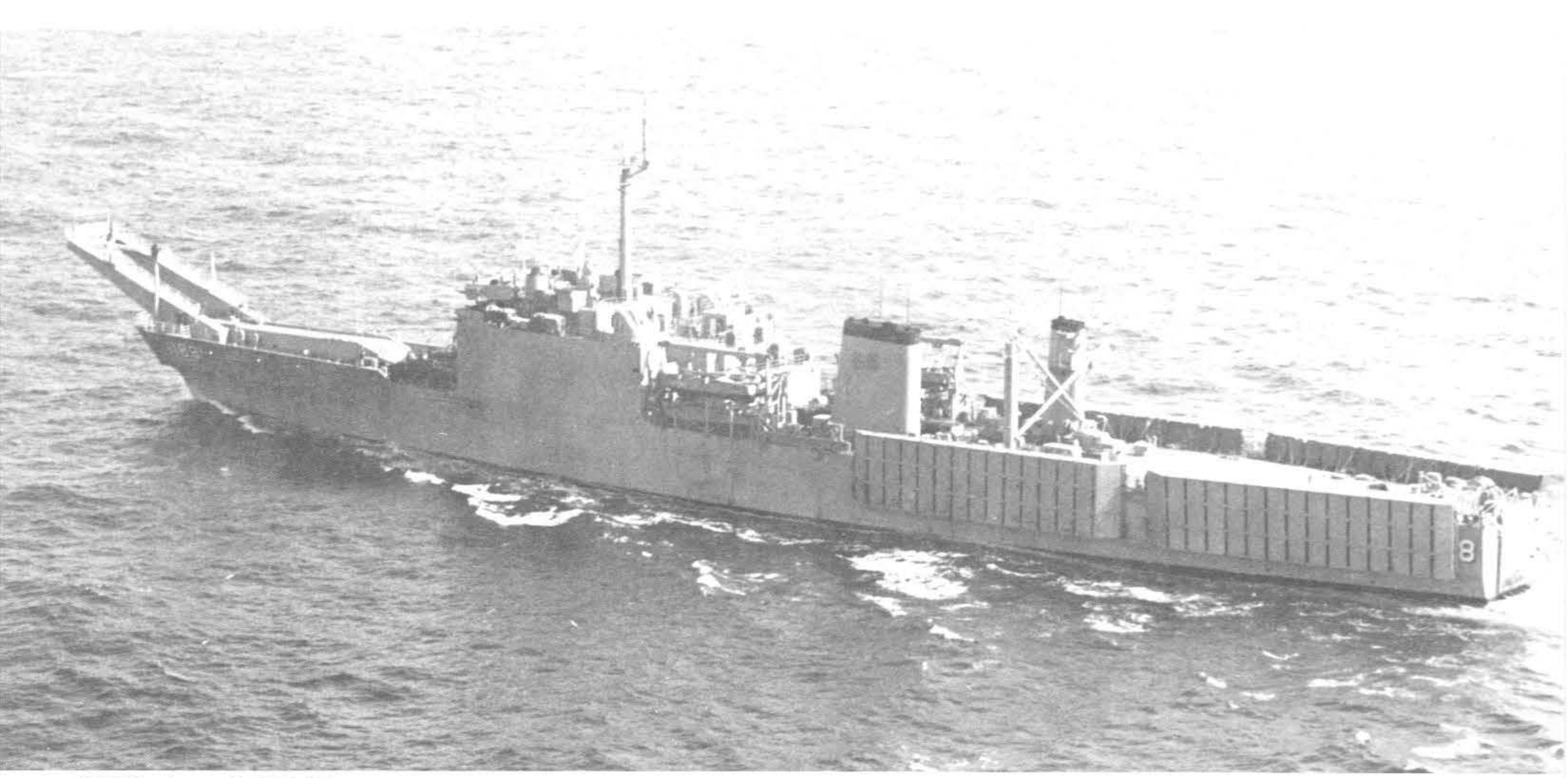
NAMRID has its main laboratory in Lima and another in the Peruvian Navy Hospital in Iquitos on the Amazon River. There is a 10-meter boat at the Iquitos facility which serves as a mobile laboratory to conduct surveys and studies on the Amazon and its tributaries. The laboratory in Lima was constructed with joint funding from the Peruvian and U.S. navies. This 22,000-square-foot building is on the grounds of the Peruvian Navy Hospital and was inaugurated 4 July 1985.

NAMRID consulted on many episodes of acute illness in Navy and Marine Corps personnel during the 1983 and 1984 UNITAS operations held between the United States and Peruvian navies. This experience led to the design of a research study to evaluate the etiologies of febrile and diarrheal diseases. The scope of such a study was too large to be handled by one laboratory; coordination was effected between NAMRID, Naval Medical Research Institute (NMRI), Bethesda, MD, and Navy Environmental and Preventive Medicine Unit No. 2 (EPMU-2), Norfolk, VA.

The protocol developed at NAMRID was for a two-part study. Part one was designed to obtain baseline data from evaluations of feces and serum obtained before personnel departure from the United States and to repeat the evaluations on samples obtained at the end of UNITAS. Part two of the study was designed to evaluate personnel presenting with acute fever, diarrhea, or both. Fever was defined as a temperature of 100° F., and diarrhea was defined as more than twice the normal daily number of bowel movements, with the fecal sample assuming the shape of the container. USS *Saginaw*, an LST, was selected as the study ship because of its large population. The 223 Navy personnel, 180 Marine Corps personnel, and 57 seabees were anticipated to have differences in environmental exposures to diseases.

NMRI carried the research protocol through approvals by NMRDC, Naval Medical Command, Medical Command for the Marine Corps, COMSOLANT, the commanding officer of *Saginaw*, and the commanding officer of the UNITAS XXVI Marine detachment. EPMU-2 provided facilities for the baseline pre-UNITAS XXVI evaluations and the coordination for obtaining samples from Navy personnel in Norfolk, VA, and Marine Corps personnel at Camp Lejeune, NC. Only volunteers who signed an informed consent were studied.

The *Saginaw* departed Norfolk on



USS Saginaw *(LST-1188)*

10 June 1985 and Marine Corps personnel boarded the vessel at Little Creek. A research laboratory technician and an investigator boarded the ship to determine attack rates from fever and/or diarrhea and to perform laboratory evaluations to determine the etiology of these illnesses. Joint naval exercises were held in Venezuela, Colombia, Panama, Ecuador, Peru, Chile, Uruguay, and Brazil over the next 119 days. The UNITAS personnel had up to 7 days liberty in each of 22 port calls in cities in these South American countries.

The commanding officer of *Saginaw* strongly recommended that the study be continued through the West Africa Training Cruise (WATC). During this 57-day mission, *Saginaw* visited Togo, Cameroon, Zaire, Equatorial Guinea, Guinea, Guinea-Bissau, and Mauritania, and returned to Roosevelt Roads on 3 Dec 1985. There were eight port calls in cities of these seven African countries.

Fecal and serum samples were obtained from over 25 percent of the crew before embarkation on UNITAS, again after leaving South America, and once again after leaving Africa. The fecal samples revealed inapparent acquisition of pathogenic bacteria in 12 individuals and parasites in only one. The paired serum samples showed that seven individuals had had hepatitis A without any symptoms of the illness.

Laboratory studies were done on 166 individuals acutely ill with fever and/or diarrhea during the cruise. Diarrhea was responsible for 80 percent of these sick call visits. Enterotoxigenic *Escherichia coli*, a bacteria, was the most frequent cause of diarrhea and *Campylobacter jejuni*, another newly recognized bacterial cause of diarrhea, was the second most common. Intestinal parasites were not a significant problem; only one individual was infected and that was with *Giardia lamblia*. The voluntary participation and continued interest in the study by the ship's officers and men clearly show their concern for health care, particularly during extended times on foreign shores.

The research laboratory also performed 1,679 tests on 220 personnel for medical complaints which did not fall into the criteria for the study. Laboratory tests for venereal diseases were the most common procedures; 21 percent of the gonococcal isolates were resistant to penicillin. Urinalysis, throat cultures, and wound culture were also done.

This 6-month shipboard study accomplished three major results. First, it clearly demonstrated that NMRDC, in collaboration with the Navy Environmental Health Center and its Environmental and Preventive Medicine Units, can and does conduct medical research which is clinically and operationally relevant. The study identified the most common bacterial and viral causes of fever and/or diarrhea; most of these agents were undoubtedly present during the 25 previous UNITAS cruises. A second result is a clear indication of areas for future research. Development of appropriate vaccines to prevent these diseases, development of rapid diagnostic technologies, and evaluation of treatment protocols to limit the manhours lost to illness are some examples. Finally, the study has provided first-hand medical information for all future U.S. naval vessels deploying to South America or West Africa. □

Dr. Kilpatrick is infectious diseases program manager, Naval Medical Research and Development Command, Naval Medical Command National Capital Region, Bethesda, MD 20814. Dr. Sphar is military assistant for medicine and life sciences, Office of the Secretary of Defense, Washington, DC 20350-1000. CAPT Mataldi is officer in charge, Navy Environmental and Preventive Medicine Unit No. 2, Norfolk, VA 23511.

Prevention of Streptococcal Pharyngitis and Acute Rheumatic Fever in Navy and Marine Corps Recruits

CAPT Alfred D. Heggie, MC, USNR

Acute rheumatic fever (ARF) is a nonsuppurative complication of pharyngitis caused by the group A streptococcus (GAS) that can result in severe heart damage, physical incapacity, and shortened life expectancy. Although ARF is primarily a disease of children, it also affects young adults, particularly under conditions of increased exposure to GAS infections such as occur during recruit training. The purpose of this article is to summarize the health hazards associated with ARF and the measures that should be taken to prevent this disease in Navy and Marine Corps recruits.

As the term ARF suggests, patients with the disease typically seek medical attention because of fever and joint symptoms. Wrists, elbows, knees, and ankles are most often involved. The joints are warm, swollen, and very tender. Usually more than one joint is affected and frequently as inflammation subsides in one joint, another becomes involved. This is described as migratory polyarthritis.

Although joint manifestations are the usual presenting complaint in ARF, inflammation of the valves and muscle of the heart may be developing concurrently. This condition is called carditis and is much more important than arthritis in relation to potential for causing permanent disability. The arthritis in ARF always resolves completely and causes no permanent damage. Carditis, in contrast, frequently results in permanent and disabling valvular heart disease.

Because of the importance of accurate diagnosis to individual patients and to programs for prevention, care should be taken to differentiate ARF from other febrile illnesses with joint manifestations. The diagnosis of ARF should be made on the basis of criteria devised by the American Heart Association.(*1*)

Pharyngeal infection with GAS appears to be the cause of ARF. The mechanisms by which infection produces this disease are poorly understood, but it is clearly the initiating event in the pathogenesis of ARF.(*2*) It has also been demonstrated conclusively that prevention or prompt treatment of pharyngitis caused by GAS prevents ARF.(*3*)

The incidence of GAS infections tends to be high in groups in which large numbers of persons live and work in close proximity and where there is a rapid turnover of personnel. Navy and Marine Corps recruit populations fall into this category. Accordingly, GAS pharyngitis and its complication, ARF, have been important problems in these groups. For example, during World War II, 21,209 cases of ARF occurred in Navy and Marine Corps recruits between 1942 and 1945.(*4*)

The highest attack rate of ARF (37.8 cases/1,000 recruits/year) occurred at the Naval Training Center at Farragut, ID, during 1943.(*5*) Although attack rates in civilian communities at that time are not precisely known, they were probably less than one case per year per 1,000 young adults. The high incidence of ARF at Farragut continued and necessitated termination of recruit training at this center in 1944, almost a year before the end of World War II.

Cases of ARF continued to be a frequent occurrence in recruit populations through the late 1950's. Largely as a result of innovative studies conducted at recruit training centers, this problem was eventually controlled by prevention of GAS infections by prophylactic treatment of incoming recruits with an intramuscular injection of benzathine penicillin.(*6*)

During the past 20 years a marked decrease in the incidence of ARF has occurred in the United States and western Europe in both civilian and military communities. In recent years ARF has been described as a "disappearing disease."(*7,8*) Although widespread use of penicillin and other effective antibiotics for the treatment and prevention of GAS pharyngitis probably contributed to this decline, other factors such as a change in the virulence of GAS are thought to have been involved. However, recent outbreaks of ARF in children in several civilian communities(*9-12*) and in Navy recruits at San Diego(*13*) indicate that after an absence of two decades a resurgence of this disease is occurring.

Prior to the cluster of cases in recruits at San Diego, the last outbreak of ARF in a military population occurred at Lowry Air Force Base, CO, in the late 1950's.(*14*) The reasons for this recent resurgence of ARF are no better understood than the reasons for its previous decline, but on the basis of past experience with the disease, it is likely that additional cases will occur in recruits unless preventive measures of proven efficacy are appropriately implemented.

Revised and updated guidelines for the control of GAS infections in Navy and Marine Corps recruits have been distributed through NAVMEDCOM Instruction 6220.6, Streptococcal Infection Control Program. Their rationale and a history of programs for the prevention of GAS infections in Navy and Marine Corps recruits are discussed in a recently published review article.(*15*) The following is a summary of these guidelines. The original instruction should be consulted for details.

The guidelines for the streptococcal control program direct that:

- The weekly incidence of pharyngitis and skin and subcutaneous infections caused by GAS must be monitored year-round at all Navy and Marine Corps recruit training centers.
- Benzathine penicillin prophylaxis (1.2 million units of Bicillin LA® in a single deep intramuscular injection into the upper outer quadrant of one buttock on the 14th day of training) must be given from October to April to incoming recruits at all Navy and Marine Corps training centers, except at Orlando, FL, and in women recruits at Parris Island, SC. The latter two groups are excluded from routine prophylaxis because, historically, they have had a low incidence of GAS infections.
- Because the duration of recruit training is 8 weeks and the duration of protection against GAS infections conferred by an injection of benzathine penicillin is 4 weeks, the guidelines provide for administration of a second penicillin injection (same dose) on the 42nd day of training, if the incidence of GAS pharyngitis equals or exceeds 10 cases per 1,000 recruits per week in recruits at or beyond the 42nd training day.
- Benzathine penicillin prophylaxis of incoming recruits must be implemented at any recruit training center, regardless of geographical location or month of the year, whenever the incidence of pharyngitis caused by GAS equals or exceeds 10 cases per 1,000 recruits per week. Under these circumstances, prophylaxis of incoming recruits must be continued for 6 weeks, or until the incidence of GAS pharyngitis decreases to less than 10 cases per 1,000 recruits per week, whichever is longer.
- Prospective recipients of prophylaxis against GAS must be questioned for histories of allergy to penicillin. Persons who report having had either immediate or delayed reactions to penicillin must be excluded from receiving prophylaxis. Although excluded persons will not be protected against acquisition of GAS infections, their risk of exposure will be greatly decreased by prophylactic treatment of the remainder of the recruit population. Penicillin-allergic recruits who contract GAS infections should be treated promptly with a 10-day course of erythromycin.

Because the recent resurgence of ARF indicates that the nature of GAS infections may be changing, these guidelines for prophylaxis may require periodic modification. For example, it may be found that control of GAS infections and ARF requires year-round penicillin prophylaxis at recruit training centers where the incidence of infection is high, as was necessary in the past when ARF was prevalent.(*6*)

The present guidelines also take into consideration the fact that certain risks are associated with penicillin prophylaxis. For example, although recruits who report a history of penicillin allergy will be excluded from receiving prophylaxis, delayed penicillin reactions, usually urticarial or serum sicknesslike, can be expected to occur in approximately 1 percent of recruits who have no history of prior penicillin allergy.*(6,16)* Anaphylactic reactions rarely occur in persons with no history of penicillin allergy, but Medical Department personnel must always be prepared to treat this life-threatening response.

Careful history-taking, although an imperfect way of predicting adverse penicillin reactions, is the only means by which these reactions can be avoided because development of laboratory tests that reliably identify persons who will have penicillin reactions has been unsuccessful. It must also be recognized that benzathine penicillin is an irritating substance that frequently causes discomfort of several days duration at the site of injection. Although usually not disabling, this discomfort may temporarily impair the performance of personnel participating in rigorous recruit training.

Injury to nerves or blood vessels resulting from incorrect placement of the deep intramuscular injection required for administration of benzathine penicillin constitutes an additional risk. This risk can be minimized by assuring that injections are given only into the upper outer quadrant of the buttock, an area that does not contain large nerves or blood vessels. Because of these risks, the guidelines provide for implementation of prophylaxis only under conditions in which experience has shown that it is clearly necessary.

The development of penicillin resistance by GAS has never been demonstrated, despite widespread use of penicillin for many years, and is unlikely to occur. An increase in rates of nasal carriage of penicillin resistant *Staphylococcus aureus* in recruits receiving bicillin prophylaxis for GAS has been reported but there was no increase in the frequency of staphylococcal infections.*(17)*

In designing the Streptococcal Infection Control Program, the estimated risks of disease were weighed against the risks associated with penicillin prophylaxis. The present guidelines were derived to deliver maximum benefits with minimum risk. The results of the program will be monitored continuously, and the guidelines will be modified appropriately whenever new information indicates a need for changes in procedure.

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Letters to Editor

CDR Mateczun and LCDR Brittain are to be commended on their fine article, "Antabuse and Optic Neuritis," appearing in the September-October 1987 issue of *Navy Medicine*. While Antabuse is an extremely safe drug, there are a few significant side effects which do occur. This is the first case of documented optic neuritis I am aware of, having prescribed Antabuse for over 18 years. There is another message in this article which must be emphasized. The majority of Antabuse side effects are dose-related. This is well illustrated in the French reference by Graveleau, "a 28-year-old woman who began treatment with disulfiram 1 g/day. She experienced a confusional attack with hallucinations associated with moderate motor deficiency of the lower limbs. A later temporary increase in disulfiram to 1.75 g/day was followed by quadriplegia and paralysis of the facial and glossopharyngeal nerves. In addition, she exhibited optic neuritis. The optic neuritis cleared rapidly with cessation of the drug, as did the paralysis of the cranial and upper limb areas. The paralysis cleared much slower in the lower limbs."

The usual dose range recommended in the *Physicians Desk Reference* is 125-500 mg/day. Typically, the patient is given 250 mg/day with a 7-10 day "loading dose" of 500 mg. In my experience, there is no rationale for a loading dose. Because the majority of side effects are dose-related, I prescribe 125 mg (½ tab)/day. This dosage is sufficient to produce an Antabuse reaction. Using this dosage for the past several years, I have noted a marked reduction in side effects with no increase in the incidence of patients drinking on Antabuse. I strongly encourage physicians to prescribe Antabuse liberally, when indicated, but do not expose the patient to unnecessary toxicity.

CAPT R.A. Golden, MC

The November-December 1987 issue of *Navy Medicine* contained an article, the title of which was incorrect. It should have been "Bug Busting" in the Philippines *II*.

I arrived in the Philippines, a young lieutenant (junior grade), just out of internship and unable to start my residency, on 6 Sept 1941. I was assigned to the Naval Hospital at Canacao. After 3 weeks I was ordered to U.S.N. Section Base, Maravales, Bataan, P.I. as the medical officer. This was a new Navy base. The floating dry dock, USS *Dewey*, had been moved there, and a base was under construction.

To quote from my diary "Left Canacao on September 26, 1941 with Dr. Hayes* (sick on the way up from a tough night before) who was on his way there to make a sanitation survey and in particular a malarial survey. Dr. Hayes spent five days there and we had a pretty good time there tramping about the country."

Dr. Hayes instructed me in collecting water from the various streams for water pollution and in gathering mosquitoes and their larvae. I continued to do this about the Bataan Peninsula and sent the collected specimens to Canacao for analysis.

It was our understanding that in 1923 something called Plan Orange had been developed. In the event of war it called for retreat to Bataan, under the protection of the guns of Corregidor, to hold Bataan until aid from the United States arrived. Despite this plan no health survey had been conducted prior to our survey in 1941, "Bug Busting" in the Philippines *I*.

John J. Bookman, M.D.

Medical Correspondence Course Management Transfer

Since 1 Nov 1987, all medically-related correspondence courses are being managed by the Naval Education and Training Program Management Support Activity (NETPMSA), Pensacola, FL. The transfer of this function will ensure better service to fleet medical personnel.

The 17 medically-related correspondence courses, formerly offered by the Naval School of Health Sciences, Bethesda, MD, provide self-paced instruction for the purpose of enhancing professional knowledge, maintaining skills, preparing for advancement in rate, and obtaining continuing medical education or continuing nursing education credits.

Applications for these courses should be made on NAVEDTRA 1510/1 (4/85). Forms may be obtained from Commanding Officer, Naval Education and Training Program Management Support Activity, Code 342, Pensacola, FL 32559-5000. Completed applications should be mailed to the same address.

For more information contact: LT J.H. Young, Autovon 922-1511/1367 or Commercial (904) 452-1329.

*See feature article same issue of *Navy Medicine*.

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